

Math 21A
Vogler
Discussion Sheet 6

2.) Evaluate the following limits by using one of the three limit definitions for e .

$$\begin{array}{lll} \text{a.) } \lim_{n \rightarrow \infty} \left(1 + \frac{2}{n}\right)^n & \text{b.) } \lim_{n \rightarrow \infty} \left(1 - \frac{3}{n}\right)^n & \text{c.) } \lim_{n \rightarrow -\infty} \left(1 + \frac{1}{5n}\right)^{4n} \\ \text{d.) } \lim_{n \rightarrow \infty} \left(\frac{n+4}{n}\right)^{-n} & \text{e.) } \lim_{n \rightarrow -\infty} \left(\frac{n}{n-5}\right)^{2n} & \text{f.) } \lim_{h \rightarrow 0} \left(1 + 3h\right)^{2/h} \end{array}$$

3.) Solve for x .

$$\begin{array}{lll} \text{a.) } \ln x = 3 & \text{b.) } \ln x = \ln 3 & \text{c.) } \ln(2x+1) - \ln(x+3) = 0 \\ \text{d.) } \ln(x-1) + \ln(x-2) = 0 & \text{e.) } \ln(x-2) + \ln(x+2) - \ln x = \ln 3 \end{array}$$

4.) Let $f(x) = x^3 \ln x$. Solve $f'(x) = 0$ and $f''(x) = 0$ for x and set up a sign chart for each.

5.) Find $y' = \frac{dy}{dx}$ as simply as possible. Do not simplify your answers.

$$\begin{array}{lll} \text{a.) } y = \ln(5x+7) & \text{b.) } y = \ln(\ln(\ln(\sin x))) & \text{c.) } y = \ln \left(\frac{x \cdot \sin(3x) \cdot (x-2)^4}{(x+1)^5 \cdot \cos(2x) \cdot \tan^{10} x} \right) \\ \text{d.) } y = x^{\ln 7} & \text{e.) } y = x^3 \cdot (x-1)^5 \cdot (2x+3)^7 \cdot (3x-4)^9 \cdot (4x+5)^{11} & \\ \text{f.) } y = (2x)^{x+3} & \text{g.) } y = x^{y^2} & \text{h.) } y = x^{(y^{\sin x})} \quad \text{i.) } y = \log_5(\log_4(\log_3 2x)) \end{array}$$

6.) Solve for x .

$$\begin{array}{lll} \text{a.) } e^x = 2 & \text{b.) } 7 \cdot e^{2x+3} = e^{3-x} & \text{c.) } (e^x + 1)(e^x - 5) = 0 \\ \text{d.) } e^{2x} - 4 \cdot e^x = 0 & \text{e.) } e^{2x} - 5 \cdot e^x + 6 = 0 \end{array}$$

7.) Find $y' = \frac{dy}{dx}$. Do not simplify your answers.

$$\begin{array}{lll} \text{a.) } y = 7 \cdot e^{5x-4} & \text{b.) } y = e^{x^2} \cdot \tan(3x) & \text{c.) } y = \frac{2^x + 4^x}{3^x + 5^x} \quad \text{d.) } y = 4^{3^{x^5}} \end{array}$$

8.) Find all horizontal asymptotes for the function in 7.)c.).

9.) Let $f(x) = x^2 \cdot e^{-x}$. Solve $f'(x) = 0$ and $f''(x) = 0$ for x and set up a sign chart for each.

11.) Differentiate.

a.) $y = \arctan(3x)$ b.) $y = x \cdot \arcsin(e^{2x})$ c.) $y = \arccos(\sin x^2)$

d.) $y = \cos^2((\arctan x)^3)$ e.) $y = \frac{\arccos x - \arctan x}{\arctan x - \arcsin x}$

f.) $y = \arcsin\left(\frac{x-1}{x+1}\right) + 2 \arctan \sqrt{x}$ (Simplify answer.)

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The following problem is for recreational purposes only.

12.) Find a hidden pattern and determine the next number in the sequence :

0, 1, 3, 7, 14, 25, 41, 63, ...